

We Claim:

- 1 1. A golf club comprising in combination a golf head and a golf shaft for providing a an
2 overall light weight golf club having a swingweight similar to a typical steel shafted golf
3 club, the light weight golf club comprising:
 - 4 a light weight golf shaft having a high swingweight comprising a primarily non-
5 metal golf shaft having a weighting plug selected from a plurality of
6 weighting plugs, a handle portion, and an end opposite the handle portion,
7 and
8 the golf head receiving the end.
- 1 2. The golf club of claim 1, wherein the weighting plug further comprises a variable
2 density plug.
- 1 3. The golf club of claim 1 wherein the plug material comprises carbon fiber reinforced
2 polycarbonate.
- 1 4. The golf club of claim 1 wherein the plug is one of a variety of plugs ranging in weight
2 by 50% relative to a minimum plug weight.
- 1 5. The golf club of claim 4 wherein the variety of plugs incorporate different density
2 materials from the group comprising: tungsten, copper, and iron; whereby a variety of
3 weights is provided.

1 6. The golf club of claim 5 wherein a plug material is resinous and the different density
2 materials are added thereto.

1 7. The golf club of claim 1 wherein the plug is fixed in the end of the golf shaft opposite
2 the handle portion of the golf shaft to simultaneously provide weight and close a hole in
3 the end of the golf shaft.

1 8. The golf club of claim 1 wherein an increase in weight due to the plug provides a
2 balance point closer to said end, whereby the swingweight is increased.

1 9. The golf club of claim 1 wherein the plug and golf shaft form a one piece composite.

1 10. The golf club of claim 1 wherein the plug is configured to be detachably supported
2 on a mandrel; the golf shaft is formed of thin layers of prepreg composite material
3 windings which overlap and fix the plug to the golf shaft; and wherein the golf head is
4 from the group of materials comprising wood, metal, plastic, and composites.

1 11. A method of using a golf club that is lighter than a typical steel shafted golf club, the
2 lighter golf club having been weighted such that the lighter golf club swingweight is
3 similar to that of the typical steel shafted golf club, the method of using comprising
4 swinging the lighter golf club with similar forces to those applied when swinging the
5 steel shafted golf club; wherein a feeling of opposite forces on the hands of a user

6 during acceleration of the lighter golf club is the same as the feeling that would be felt
7 when using the steel shafted golf club.

1 12. A light weight golf club with a high swingweight comprising:
2 a golf shaft and a golf head;
3 wherein the golf shaft is made light and to have the high swingweight by the
4 process of:
5 impregnating a resin with high density material,
6 molding the resin into a plug,
7 attaching the plug to the golf shaft;
8 wherein the impregnated resin has a higher density than a non-impregnated
9 resin.

1 13. A light weight golf shaft having a high swingweight , the golf shaft comprising a
2 weighting plug selected from a plurality of weighting plugs.

1 14. The golf shaft of claim 13 wherein the weighting plug comprises a variable density
2 plug.

1 15. The golf shaft of claim 13 wherein the plug material comprises carbon fiber
2 reinforced polycarbonate.

1 16. The golf shaft of claim 13 wherein the plug is one of a variety of plugs ranging in
2 weight by 50% relative to a minimum plug weight.

1 17. The golf shaft of claim 16 wherein the variety of plugs incorporates different density
2 materials from the group comprising: tungsten, copper, and iron; whereby a variety of
3 weights is provided.

1 18. The golf shaft of claim 17 wherein a plug material is resinous and the different
2 density materials are added thereto.

1 19. The golf shaft of claim 13 wherein the plug is fixed in an end of the golf shaft
2 opposite a handle portion of the golf shaft to simultaneously provide weight and close a
3 hole in the end of the golf shaft.

1 20. The golf shaft of claim 13 wherein an increase in weight due to the plug provides a
2 balance point closer to said end, whereby the swingweight is increased.

1 21. The golf shaft of claim 13 wherein the plug and golf shaft form a one piece
2 composite.

1 22. The golf shaft of claim 13 wherein the plug is configured to be detachably supported
2 on a mandrel; and the golf shaft is formed of thin layers of prepreg composite material
3 windings which overlap and fix the plug to the golf shaft.

1 23. A golf shaft with a high swingweight comprising:
2 a golf shaft;

3 wherein the golf shaft is made light and to have the high swingweight by the
4 process of:

5 impregnating a resin with high density material,
6 molding the resin into a plug,
7 attaching the plug to the golf shaft;

8 wherein the impregnated resin has a higher density than a non-impregnated
9 resin.

1 24. A method of making a light weight golf club for reducing the overall weight of the golf
2 club while providing a swingweight similar to that of a typical steel shafted golf club, the
3 method comprising the steps of:

4 (a) providing a light weight golf shaft with a weighting plug selected from a
5 plurality of weighting plugs, and
6 (b) attaching a golf head to the golf shaft.

1 25. The method of claim 24 and further comprising the step of weighting the plug.

1 26. The method of claim 24 comprising forming the plug and golf shaft into a one piece
2 composite member.

1 27. The method of claim 24 wherein making the light weight golf club comprises making
2 a light weight golf shaft with a swingweight of a typical steel golf shaft, the method
3 further comprising:

4 (a) forming the golf shaft of composite plastic materials of total mass less than
5 100g,
6 (b) positioning a balance point of the light weight golf shaft such that the force
7 required for a particular swing acceleration is substantially equivalent to a
8 force required for the same swing acceleration of the typical steel golf shaft
9 having a total mass of over 100g.

1 28. The method of claim 27 wherein the step of positioning further includes the step of
2 selectively attaching a plug of a specific weight to the light weight golf shaft, said weight
3 depending on a predetermined length of the golf club for enhancing playability of a set
4 of golf clubs thus made.

1 29. The method of claim 24 and further comprising the step of filling a hole in a tip end
2 of the golf shaft simultaneously with the step of providing the weighting plug by filling the
3 hole with the plug.

1 30. The method of claim 24, the steps further comprising the step of selectively varying
2 the weight of the plug by up to 50% relative to a minimum plug weight.

1 31. The method of claim 24, the steps further comprising the step of selectively
2 choosing the golf head and plug based on a selection of plugs varying in weight by 50%
3 relative to a minimum plug weight.

- 1 32. The method of claim 24 wherein the step of providing the light weight golf shaft
- 2 further comprises:
 - 3 (a) forming the weighting plug,
 - 4 (b) locating the balance point further from a handle portion of the light weight
 - 5 golf shaft by incorporating the plug as an integral part of an end of the light
 - 6 weight golf shaft opposite the handle portion.
- 1 33. The method of claim 32 and further comprising the step of selectively locating the
- 2 balance point away from the handle portion of the composite golf shaft by selectively
- 3 adding a dense material to the plug.
- 1 34. The method of claim 33 wherein the dense material is selected from the group of
- 2 different density materials comprising: tungsten, copper, and iron.
- 1 35. The method of claim 33 wherein the plug is formed of a moldable resin and further
- 2 including the step of adding the dense material to the resin.
- 1 36. The method of claim 35 wherein the dense material is selected from the group of
- 2 different density materials comprising: tungsten, copper, and iron.
- 1 37. The method of claim 32 comprising forming the plug and golf shaft into a one piece
- 2 composite member.

1 38. The method of claim 32 and further including the steps of:

2 (a) molding an end of the plug such that it can be removably supported on a

3 mandrel,

4 (b) mounting the plug on the mandrel,

5 (c) forming the golf shaft and fixing the golf shaft to the plug by rolling thin

6 layers of prepreg composite materials onto the mandrel and plug in a

7 predetermined order,

8 (d) wrapping the mandrel, composite materials, and plug with thin cellophane

9 or polypropylene,

10 (e) hardening and curing the golf shaft by heating, and

11 (f) removing the golf shaft with the plug from the mandrel;

12 wherein the composite layers form the golf shaft and wherein the plug is made integral

13 by the wrapping and curing steps.

1 39. A method of making a light weight golf shaft with a swingweight of a typical steel golf

2 shaft, the method comprising:

3 (a) providing a light weight golf shaft with a weighting plug selected from a

4 plurality of weighting plugs.

1 40. The method of claim 39 and further comprising the step of weighting the plug.

1 41. The method of claim 39 comprising forming the plug and golf shaft into a one piece

2 composite member.

1 42. The method of claim 39 comprising:

- 2 (a) forming the golf shaft of composite plastic materials of total mass less than
3 100g,
4 (b) positioning a balance point of the light weight golf shaft such that the force
5 required for a particular swing acceleration is substantially equivalent to a
6 force required for the same swing acceleration of the typical steel golf shaft
7 having a total mass of over 100g.

1 43. The method of claim 42 wherein the step of positioning further includes the step of
2 selectively attaching a plug of a specific weight to the light weight golf shaft.

1 44. The method of claim 39 and further comprising the step of filling a hole in a tip end
2 of the light weight golf shaft simultaneously with the step of providing the weighting plug
3 by filling the hole with the plug.

1 45. The method of claim 39, further comprising the step of selectively varying the weight
2 of the plug by 50% relative to a minimum plug weight.

1 46. The method of claim 39 wherein the step further comprises:

- 2 (a) forming the weighting plug,
3 (b) locating the balance point further from a handle portion of the light weight
4 golf shaft by incorporating the plug as an integral part of an end of the light
5 weight golf shaft opposite the handle portion.

1 47. The method of claim 46 and further comprising the step of selectively locating the
2 balance point away from the handle portion of the composite golf shaft by selectively
3 adding a dense material to the plug.

1 48. The method of claim 47 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.

1 49. The method of claim 47 wherein the plug is formed of a moldable resin and further
2 including the step of adding the dense material to the resin.

1 50. The method of claim 49 wherein the dense material is selected from the group of
2 different density materials comprising: tungsten, copper, and iron.

1 51. The method of claim 46 comprising forming the plug and golf shaft into a one piece
2 composite member.

1 52. The method of claim 46 and further including the steps of:

2 (a) molding an end of the plug such that it can be removably supported on a
3 mandrel,
4 (b) mounting the plug on the mandrel,
5 (c) forming the golf shaft and fixing the golf shaft to the plug by rolling thin
6 layers of prepreg composite materials onto the mandrel and plug in a
7 predetermined order,

8 (d) wrapping the mandrel, composite materials, and plug with thin cellophane
9 or polypropylene,
10 (e) hardening and curing the golf shaft by heating, and
11 (f) removing the golf shaft with the plug from the mandrel;
12 wherein the composite layers form the golf shaft and wherein the plug is made integral
13 by the wrapping and curing steps.

1 53. A set of golf clubs wherein each club comprises a weighting plug selected from a
2 plurality of weighting plugs having a variety of weights; whereby the set of golf clubs has
3 enhanced playability.

1 54. A set of golf shafts wherein each golf shaft comprises a weighting plug selected
2 from a plurality of weighting plugs having a variety of weights; whereby a set of golf
3 clubs made from said set of shafts has enhanced playability.

1 55. Method of making a set of golf clubs comprising:
2 (a) selecting weighting plugs from a plurality of weighting plugs having a
3 variety of weights,
4 (b) providing one of said weighting plugs on each golf club of the set;
5 whereby the set of golf clubs has enhanced playability.

1 56. Method of making a set of golf shafts comprising:
2 (a) selecting weighting plugs from a plurality of weighting plugs having a
3 variety of weights,

- 4 (b) providing one of said weighting plugs on each golf shaft of the set;
- 5 whereby a set of golf clubs made from said set of golf shafts has enhanced playability.